



**Williston, ND – Red River Facility**  
**Preliminary Air Monitoring Summary Report**  
**August 19, 2014**

This report discusses air monitoring data recorded during night shift operations from August 03, 2014 to August 18, 2014 (between the hours of 19:00 and 07:00) in support of response operations conducted at the Red River Supply facility in Williston, ND. Real-time air monitoring was conducted near the incident site using hand-held instruments such as the RAE Systems MultiRAE, TSI Sidepak AM510 personal aerosol monitor, and Gastec colorimetric detector tubes; and remote-telemetering instruments such as the RAE Systems AreaRAE.

Monitoring levels were established for volatile organic compounds (VOC), 10 micron particulate matter ( $PM_{10}$ ), percent of the lower explosive limit (LEL), and carbon monoxide. These monitoring levels are detailed in the CTEH Air Sampling and Analysis Plan (SAP).

Remote-telemetered AreaRAE data for this period is provided in Table 1. The Data presented in this table is preliminary, having not undergone the full QA/QC process. A map of these monitoring locations is included within the attachment.

Data-logging AM510 aerosol monitoring stations were deployed alongside each AreaRAE unit to provide continuous monitoring of particulate matter. Data from these logs is provided in Table 2. Data presented in this table is preliminary, having not undergone the full QA/QC process.

Data collected using hand-held instruments is provided in Table 3. Data presented in this table is preliminary, having not undergone the full QA/QC process. A map of monitoring locations is included within the attachment.

**Table 1:**  
**Remote-telemetered Real-Time Air Monitoring Results**  
**August 03, 2014 to August 18, 2014 19:00 - 07:00**

| Unit                | Analyte | Number of Readings | Number of Detections | Average of Detections | Range of Detections |
|---------------------|---------|--------------------|----------------------|-----------------------|---------------------|
| AS01<br>(West)      | CO      | 39,115             | 221                  | 0.3 ppm               | 0.1 - 1.6 ppm       |
|                     | LEL     | 39,115             | 0                    | NA                    | < 1.0 %             |
|                     | SO2     | 14,195             | 0                    | NA                    | < 0.1 ppm           |
|                     | VOC     | 39,115             | 1                    | 0.1 ppm               | 0.1 - 0.1 ppm       |
| AS02<br>(North)     | CO      | 37,706             | 5,111                | 0.5 ppm               | 0.1 - 47.9 ppm      |
|                     | LEL     | 37,706             | 0                    | NA                    | < 1.0 %             |
|                     | O2      | 1,605              | 1,605                | 20.90%                | 20.9 - 20.9 %       |
|                     | SO2     | 13,321             | 39                   | 0.1 ppm               | 0.1 - 0.1 ppm       |
| AS04<br>(South)     | VOC     | 37,706             | 1,369                | 0.2 ppm               | 0.1 - 0.9 ppm       |
|                     | CO      | 38,977             | 101                  | 0.8 ppm               | 0.1 - 18.9 ppm      |
|                     | LEL     | 38,977             | 0                    | NA                    | < 1.0 %             |
|                     | SO2     | 14,036             | 0                    | NA                    | < 0.1 ppm           |
| AS05<br>(East)      | VOC     | 38,977             | 22                   | 0.1 ppm               | 0.1 - 0.3 ppm       |
|                     | CO      | 13,679             | 1,337                | 0.3 ppm               | 0.1 - 11.2 ppm      |
|                     | LEL     | 13,679             | 0                    | NA                    | < 1.0 %             |
|                     | SO2     | 13,679             | 72                   | 0.1 ppm               | 0.1 - 0.3 ppm       |
| AS09<br>(Southeast) | VOC     | 13,679             | 407                  | 0.1 ppm               | 0.1 - 4.3 ppm       |
|                     | CO      | 37,037             | 3,278                | 0.5 ppm               | 0.1 - 17.5 ppm      |
|                     | LEL     | 37,037             | 0                    | NA                    | < 1.0 %             |
|                     | SO2     | 13,720             | 107                  | 0.1 ppm               | 0.1 - 0.1 ppm       |
| AS10<br>(East)      | VOC     | 37,037             | 1,131                | 0.1 ppm               | 0.1 - 0.2 ppm       |
|                     | CO      | 23,621             | 2,319                | 0.5 ppm               | 0.1 - 18.4 ppm      |
|                     | LEL     | 23,621             | 0                    | NA                    | < 1.0 %             |
|                     | O2      | 2,318              | 2,318                | 20.90%                | 20.9 - 20.9 %       |
|                     | VOC     | 23,621             | 613                  | 0.2 ppm               | 0.1 - 13.1 ppm      |

\*Electronic Sensor resolution for CO is 1.0 ppm

**Table 2:**  
**Data-logged Real-Time Air Monitoring Results**  
**August 03, 2014 to August 18, 2014 19:00 - 07:00**

| Location            | Analyte | Number of Readings | Average of Detections   | Range of Detections             |
|---------------------|---------|--------------------|-------------------------|---------------------------------|
| AS01<br>(West)      | PM10    | 1203               | 0.026 mg/m <sup>3</sup> | 0.001 - 0.293 mg/m <sup>3</sup> |
|                     | PM2.5   | 687                | 0.029 mg/m <sup>3</sup> | 0.011 - 0.206 mg/m <sup>3</sup> |
| AS02<br>(North)     | PM10    | 1028               | 0.027 mg/m <sup>3</sup> | 0.001 - 0.109 mg/m <sup>3</sup> |
|                     | PM2.5   | 553                | 0.024 mg/m <sup>3</sup> | 0.011 - 0.093 mg/m <sup>3</sup> |
| AS04<br>(South)     | PM10    | 1200               | 0.028 mg/m <sup>3</sup> | 0.001 - 0.238 mg/m <sup>3</sup> |
|                     | PM2.5   | 713                | 0.025 mg/m <sup>3</sup> | 0.01 - 0.229 mg/m <sup>3</sup>  |
| AS05<br>(East)      | PM10    | 1201               | 0.018 mg/m <sup>3</sup> | 0.001 - 0.073 mg/m <sup>3</sup> |
|                     | PM2.5   | 633                | 0.025 mg/m <sup>3</sup> | 0.005 - 0.063 mg/m <sup>3</sup> |
| AS09<br>(Southeast) | PM10    | 2470               | 0.017 mg/m <sup>3</sup> | 0.001 - 0.191 mg/m <sup>3</sup> |
|                     | PM2.5   | 558                | 0.025 mg/m <sup>3</sup> | 0.011 - 0.054 mg/m <sup>3</sup> |

\*Note that the AM510 instrument overestimates particulate concentrations in air at higher relative humidity. In addition, the AM510 has been shown to overestimate the concentrations of particulate in smoke from cigarettes, burning wood, and other sources.

**Table 3:**  
**Hand-held Real-Time Air Monitoring Results**  
**August 03, 2014 to August 18, 2014 19:00 - 07:00**

| Location  | Analyte | Instrument   | Number of Readings | Number of Detections | Average of Detections   | Range of Detections             |
|-----------|---------|--------------|--------------------|----------------------|-------------------------|---------------------------------|
| Community | Benzene | UltraRAE     | 4                  | 0                    | NA                      | < 0.05 ppm                      |
|           | CO      | MultiRAE     | 600                | 1                    | 1 ppm                   | 1 - 1 ppm                       |
|           | LEL     | MultiRAE     | 61                 | 0                    | NA                      | < 1 %                           |
|           | O2      | MultiRAE     | 28                 | 28                   | 20.9 %                  | 20.9 - 20.9 %                   |
|           | PM10    | Dusttrak     | 537                | 537                  | 0.047 mg/m <sup>3</sup> | 0.001 - 0.277 mg/m <sup>3</sup> |
|           | PM10    | AM510        | 718                | 718                  | 0.028 mg/m <sup>3</sup> | 0.001 - 0.187 mg/m <sup>3</sup> |
|           | PM2.5   | AM510        | 411                | 411                  | 0.045 mg/m <sup>3</sup> | 0.009 - 1.01 mg/m <sup>3</sup>  |
|           | PM2.5   | Dusttrak     | 599                | 599                  | 0.036 mg/m <sup>3</sup> | 0.009 - 0.92 mg/m <sup>3</sup>  |
|           | SO2     | MultiRAE     | 389                | 0                    | NA                      | < 0.1 ppm                       |
|           | VOC     | MultiRAE Pro | 2                  | 0                    | NA                      | < 0.1 ppm                       |
| Burn Area | VOC     | MultiRAE     | 1149               | 2                    | 0.4 ppm                 | 0.3 - 0.5 ppm                   |
|           | VOC     | Dusttrak     | 1                  | 1                    | 0.1 ppm                 | 0.051 - 0.051 ppm               |
|           | CO      | MultiRAE     | 327                | 4                    | 1.8 ppm                 | 1 - 3 ppm                       |
|           | H2S     | MultiRAE     | 105                | 0                    | NA                      | < 1 ppm                         |
|           | LEL     | MultiRAE     | 197                | 0                    | NA                      | < 1 %                           |
|           | O2      | MultiRAE     | 28                 | 28                   | 20.9 %                  | 20.9 - 20.9 %                   |
|           | PM10    | AM510        | 132                | 132                  | 0.05 mg/m <sup>3</sup>  | 0.003 - 0.423 mg/m <sup>3</sup> |
|           | PM2.5   | AM510        | 161                | 161                  | 0.266 mg/m <sup>3</sup> | 0.008 - 1.82 mg/m <sup>3</sup>  |
|           | SO2     | MultiRAE     | 155                | 0                    | NA                      | < 0.1 ppm                       |
|           | VOC     | MultiRAE     | 323                | 13                   | 0.3 ppm                 | 0.1 - 2 ppm                     |

| Location                       | Analyte | Instrument  | Number of Readings | Number of Detections | Average of Detections | Range of Detections |
|--------------------------------|---------|-------------|--------------------|----------------------|-----------------------|---------------------|
| Contamination Reduction Zone   | Benzene | UltraRAE    | 4                  | 0                    | NA                    | < 0.05 ppm          |
|                                | CO      | MultiRAE    | 435                | 10                   | 5.7 ppm               | 1 - 23 ppm          |
|                                | CO      | Gastec 1LC  | 5                  | 1                    | 0.5 ppm               | 0.5 - 0.5 ppm       |
|                                | H2S     | MultiRAE    | 3                  | 0                    | NA                    | < 1 ppm             |
|                                | LEL     | MultiRAE    | 384                | 0                    | NA                    | < 1 %               |
|                                | O2      | MultiRAE    | 228                | 225                  | 20.9 %                | 20.9 - 20.9 %       |
|                                | PM10    | AM510       | 222                | 222                  | 0.028 mg/m3           | 0.003 - 0.202 mg/m3 |
|                                | PM2.5   | Dusttrak    | 72                 | 72                   | 0.033 mg/m3           | 0.01 - 0.214 mg/m3  |
|                                | PM2.5   | AM510       | 257                | 257                  | 0.039 mg/m3           | 0.005 - 2.13 mg/m3  |
|                                | SO2     | MultiRAE    | 201                | 0                    | NA                    | < 0.1 ppm           |
|                                | VOC     | MultiRAE    | 536                | 3                    | 3.5 ppm               | 0.1 - 10.2 ppm      |
| Frac Tank Staging Area         | Benzene | UltraRAE    | 4                  | 4                    | 0.4 ppm               | 0.05 - 1.5 ppm      |
|                                | Benzene | Gastec 121L | 3                  | 1                    | 0.5 ppm               | 0.5 - 0.5 ppm       |
|                                | CO      | MultiRAE    | 1                  | 1                    | 23 ppm                | 23 - 23 ppm         |
|                                | H2S     | MultiRAE    | 20                 | 5                    | 12.8 ppm              | 2 - 44 ppm          |
|                                | LEL     | MultiRAE    | 1                  | 1                    | 8 %                   | 8 - 8 %             |
| Little Muddy River Relief Area | VOC     | MultiRAE    | 21                 | 19                   | 66.8 ppm              | 1.4 - 562 ppm       |
|                                | CO      | MultiRAE    | 15                 | 0                    | NA                    | < 1 ppm             |
|                                | PM10    | AM510       | 15                 | 15                   | 0.032 mg/m3           | 0.013 - 0.057 mg/m3 |
|                                | PM2.5   | AM510       | 14                 | 14                   | 0.035 mg/m3           | 0.024 - 0.06 mg/m3  |
|                                | PM2.5   | Dusttrak    | 20                 | 20                   | 0.031 mg/m3           | 0.018 - 0.048 mg/m3 |
| Red River Property             | SO2     | MultiRAE    | 5                  | 0                    | NA                    | < 0.1 ppm           |
|                                | VOC     | MultiRAE    | 24                 | 0                    | NA                    | < 0.1 ppm           |
|                                | CO      | MultiRAE    | 4                  | 0                    | NA                    | < 1 ppm             |
|                                | H2S     | MultiRAE    | 4                  | 0                    | NA                    | < 1 ppm             |
|                                | LEL     | MultiRAE    | 4                  | 0                    | NA                    | < 1 %               |
|                                | O2      | MultiRAE    | 4                  | 4                    | 20.9 %                | 20.9 - 20.9 %       |
|                                | PM10    | AM510       | 4                  | 4                    | 0.06 mg/m3            | 0.034 - 0.109 mg/m3 |
|                                | VOC     | MultiRAE    | 4                  | 0                    | NA                    | < 0.1 ppm           |

\*Note that the AM510 instrument overestimates particulate concentrations in air at higher relative humidity. In addition, the AM510 has been shown to overestimate the concentrations of particulate in smoke from cigarettes, burning wood, and other sources.

\*\*Median